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9 EPA Base Case 2000 Results

Previous chapters of this report have focused on the methodological underpinnings of IPM (Chapter 2) and the assumptions underlying EPA Base Case 2000 (Chapters 3-8). The current chapter is devoted to a discussion of the key results forecasted under the base case. Before turning to these results, there is a short summary of the base case emissions specifications.

9.1 Scenario Specifications

The EPA Base Case 2000 takes into account Federal and state laws and regulations, that affect air emissions from the electric power sector in the contiguous U.S. 48 states and the District of Columbia. At the Federal level these include SO₂ and NO_x air regulations implementing Title IV of the Clean Air Act Amendments of 1990 (CAAA) and the NO_x SIP Call. Through unit specific baseline emission rates for existing and planned/committed units, EPA Base Case 2000 captures Title IV NO_x rate limits, RACT and BACT limits, and NSPS requirements¹. In addition, the EPA Base Case 2000 also incorporates state-specific regulations for SO₂ and NO_x in Connecticut, NO_x in Missouri and NO_x in Texas.

Section 3.9 fully describes the specifics of the existing air regulations modeled in the EPA Base Case 2000. Here we simply describe the specifications incorporated in EPA Based Case 2000 to implement the Federal emission limits.

Table 9.1 presents the emission limit specifications that are implemented in EPA Base Case 2000 to represent the SO₂ Title IV and NO_x SIP Call air regulatory programs. The national SO₂ program in EPA Base Case 2000 is based on Title IV of the CAAA, which allows for annual SO₂ trading with emissions capped at 9.47 millions tons for years through 2009 and at 8.95 million tons for years 2010 onward. Since the first model year in EPA Base Case 2000 is 2005, the base case includes an initial emissions allowance bank estimated at 3.688 million tons. The NO_x SIP Call budget cap of 473 thousand tons applies to the summer ozone season (May – September) over the entire modeling time horizon. The SO₂ and NO_x provisions include both trading and banking of emission allowances. In the EPA Base 2000, the modeled emissions caps are averages of actual caps for the years mapped to the run years. For example, the SO₂ cap of 10.699 million tons shown in Table 9.1 for Run Year 2005 is the average of 13.158 million tons in 2005 (an initial bank of 3.688 million tons added to the 9.47 million ton cap) and 9.47 million tons in years 2006 and 2007. Similarly, the SO₂ cap of 9.158 million tons in Run Year 2010 is the average of the caps of 9.47 million tons for years 2008 and 2009 and 8.95 million tons for 2010-2012.

There are several additional points to note about the environmental regulations that are included in EPA Base Case 2000. First, they reflect only those Federal and state laws and regulations whose provisions were either in effect or enacted and clearly delineated. Thus, as explained in Chapter 1, future National Ambient Air Quality Standards (NAAQS) for ozone and fine particles, Maximum Achievable Control Technology (MACT) standards for mercury, and regional haze and Best Available Retrofit Technology (BART) requirements are not included in EPA Base Case 2000. Second, by including only those air emission regulations whose provisions were well defined, the base case is designed to be policy neutral. It is neither a projection of provisions that may become effective in the future, nor does it represent EPA's position on regulations that the agency might propose in the future.

¹RACT refers to Reasonable Available Control Technology limits that apply in ozone non-attainment areas and the Ozone Transport Region. BACT refers to Best Available Control Technology limits that apply to new units in attainment areas. NSPS refers to New Source Performance Standards (NSPS) which establish emission limitations for stationary sources in specific industrial categories. (See section 3.9 for a fuller discussion of the handling of existing environment regulations.)

Table 9.1. SO₂ Title IV and NO_x SIP Call Regulatory Specifications in EPA Base Case 2000

	NO _x SIP Call	Title IV SO ₂ Program
Type of Emission Limit	Cap	Cap
Trading	Yes	Yes
Banking	Yes	Yes
Starting Model Year	2005	2005
Season	Ozone Season (May-September)	Annual
Scope	SIP Call Region*	National
Affected Units	All Fossil	All Fossil > 25 MW
<u>Program Caps (in thousand tons)</u>		
Run Year 1 - 2005	473	10,699
Run Year 2 - 2010	473	9,158
Run Year 3 - 2015	473	8,950
Run Year 4 - 2020	473	8,950
Run Year 5 - 2026	473	8,950

*The SIP Call region includes 19 states and the District of Columbia. The affected states are Alabama, Connecticut, Delaware, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Michigan, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, and West Virginia.

9.2 Summary of Results

This section summarizes the results of the EPA Base Case 2000 in terms of the issue areas that are most likely to arise when comparing future policy runs to the base case. These areas include changes in electric generation and capacity (including trends in capacity additions, repowerings, and retrofits), air emissions, fuel usage projections, and cost and price forecasts.

9.2.1 Electric Power Generation by Fuel Type

Under EPA Base Case 2000 total electric generation is projected to grow 16% between 2005 and 2020 (from 3,950 billion KWh in 2005 to 4,599 billion KWh in 2020). Over the entire 2005-2020 modeling period the largest share of generation is from coal (representing 53.7% of total generation in 2005 and 48.2% in 2020), followed by natural gas/oil (representing 20.1% of total generation in 2005 and 31.5% in 2020) and nuclear (representing 16.4% of total generation in 2005 and 12.3% in 2020). This is summarized in Table 9.2 and illustrated in Figure 9.1.

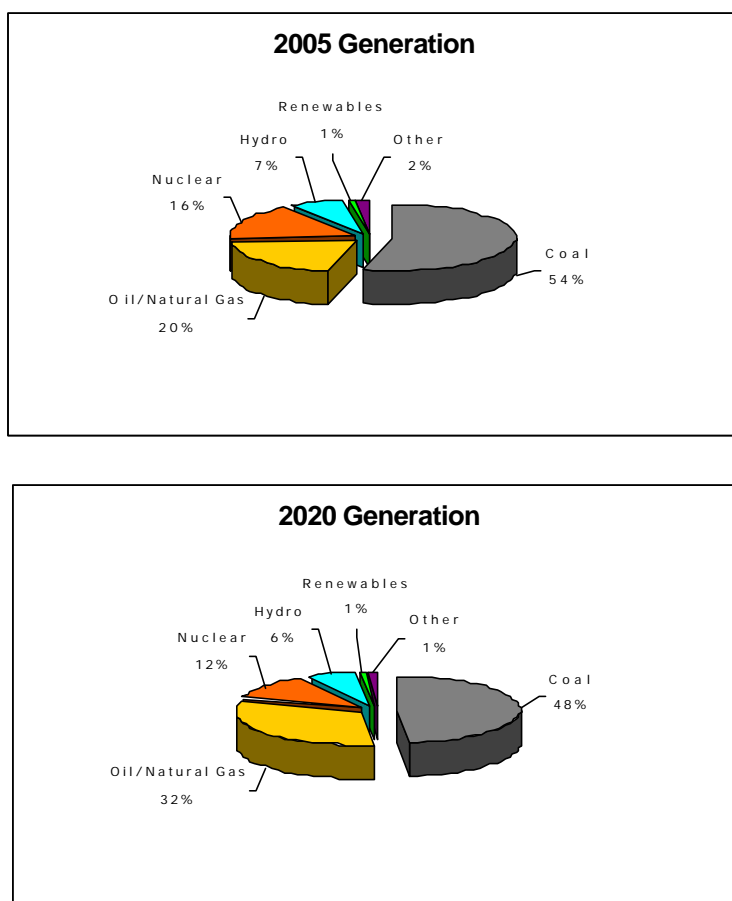
Table 9.2. Electric Generation by Run Year under EPA Base Case 2000

Fuel Type	2005		2010		2015		2020	
	Billion KWh	% Share	Billion KWh	% Share	Billion KWh	% Share	Billion KWh	% Share
Coal	2,122	53.7%	2,161	52.1%	2,191	49.9%	2,218	48.2%
Oil/Natural Gas	793	20.1%	1,004	24.2%	1,239	28.2%	1,450	31.5%
Nuclear	648	16.4%	611	14.7%	590	13.4%	566	12.3%
Hydro	280	7.1%	280	6.8%	280	6.4%	280	6.1%
Renewables	34	0.9%	34	0.8%	34	0.8%	34	0.7%
Other	73	1.8%	56	1.4%	58	1.3%	51	1.1%
Total	3,950	100.0%	4,146	100.0%	4,392	100.0%	4,599	100.0%

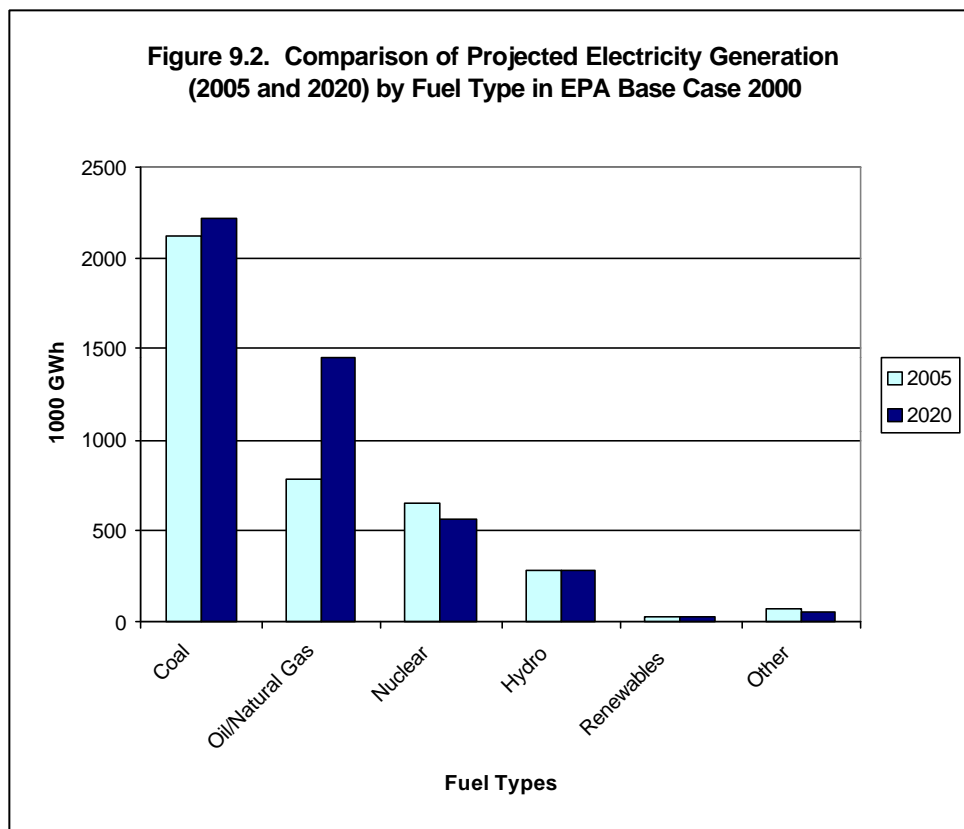
Notes:

- 1."Hydro" includes approximately 10 billion kWh of generation in 2005 and 11 billion kWh of generation in 2010, 2015, and 2020 from pumped storage.
2. "Other" includes international electricity imports and electricity generated by plants not falling in the previously listed categories.

Figure 9.1. Generation Mix in 2005 and 2020 under EPA Base Case 2000



There are marked differences in the growth rates of electricity generation from different fuels. Between 2005 and 2020, generation from natural gas/oil experiences a growth of 82.8% (from 793 billion KWh in 2005 to 1,450 billion KWh in 2020) compared to a 4.5% growth in generation from coal (from 2,122 billion KWh in 2005 to 2,218 billion KWh in 2020) , and a 12.7% decline in generation from nuclear sources (from 648 billion KWh in 2005 to 566 billion KWh in 2020). Figure 9.2 illustrates the different growth rates by providing side-by-side comparisons of the 2005 and 2020 generation levels for each fuel type.

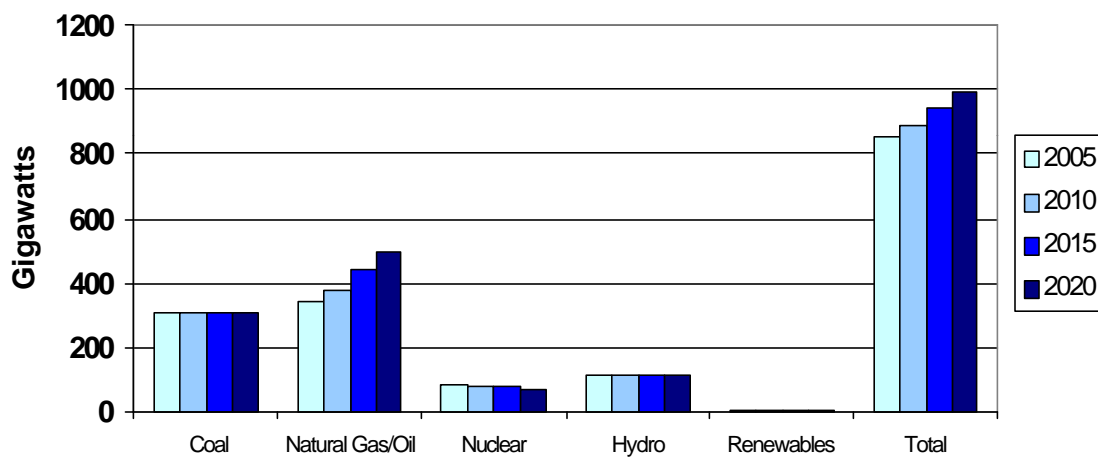


9.2.2 Capacity Changes

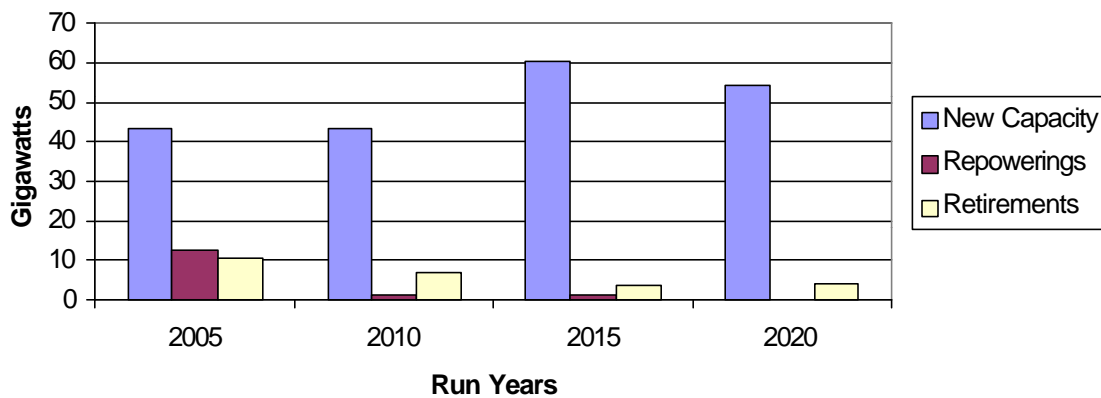
Overall Trends: Under EPA Base Case 2000 electric generating capacity is projected to grow by 17.0% between 2005 and 2020 (from 851 GW in 2005 to 996 GW in 2020). As seen in Figure 9.3 all the capacity growth is in natural gas/oil plants which grow by 47.2% (from 337 GW in 2005 to 496 GW in 2020). As discussed in the next paragraph, all of this additional capacity is from combustion turbine and combined cycle units. Nuclear capacity is projected to decline 16.5% (from 86.5 GW in 2005 to 72.2 GW in 2020). The capacity for all other fuels is projected to remain unchanged over the 2005-2020 period

During the 2005-2020 modeling period, 201 GW of new capacity is projected to be added and 15 GW of oil/gas steam units are projected to be repowered to combined cycle gas. During this period, 23.4 GW of nuclear capacity is projected to be retired: 6.8 GW of scheduled retirements for which the model did not find it economically advantageous to invest in a 10-year life extension at age 30 or a 20-year relicensing at age 40; 2.2 GW of early (i.e., economic) retirements in the 2005 run year; and 14.3 GW in early (economic) retirements between 2005 and 2020 that was noted in the previous paragraph. During this same period, 1.6 GW of oil/gas steam units are projected to be retired. These changes are shown in Figure 9.4. As seen in Figure 9.5, 53.3% (107 GW) of the new capacity added between 2005 and 2020 is from combustion turbines and 46.7% (94 GW) is from combined cycle units.

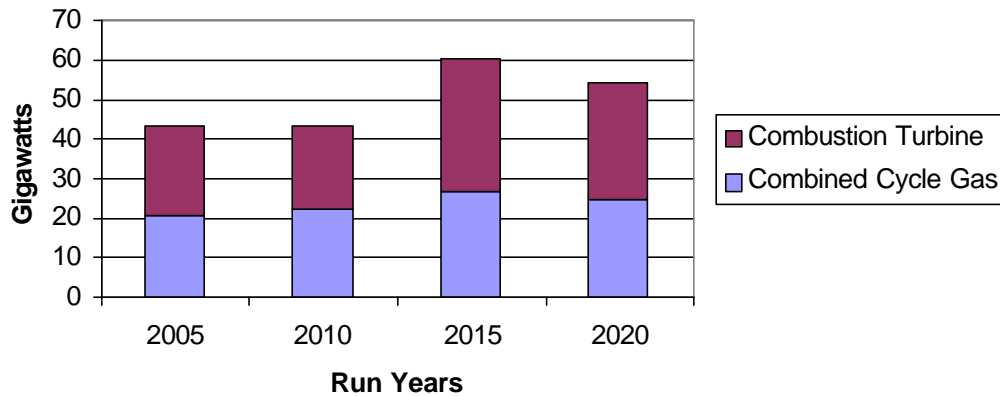
**Figure 9.3. Projected Capacity 2005-2020
By Fuel Type in EPA Base Case 2000**



**Figure 9.4. Projected New Capacity, Repowerings, and
Retirements in EPA Base Case 2000**



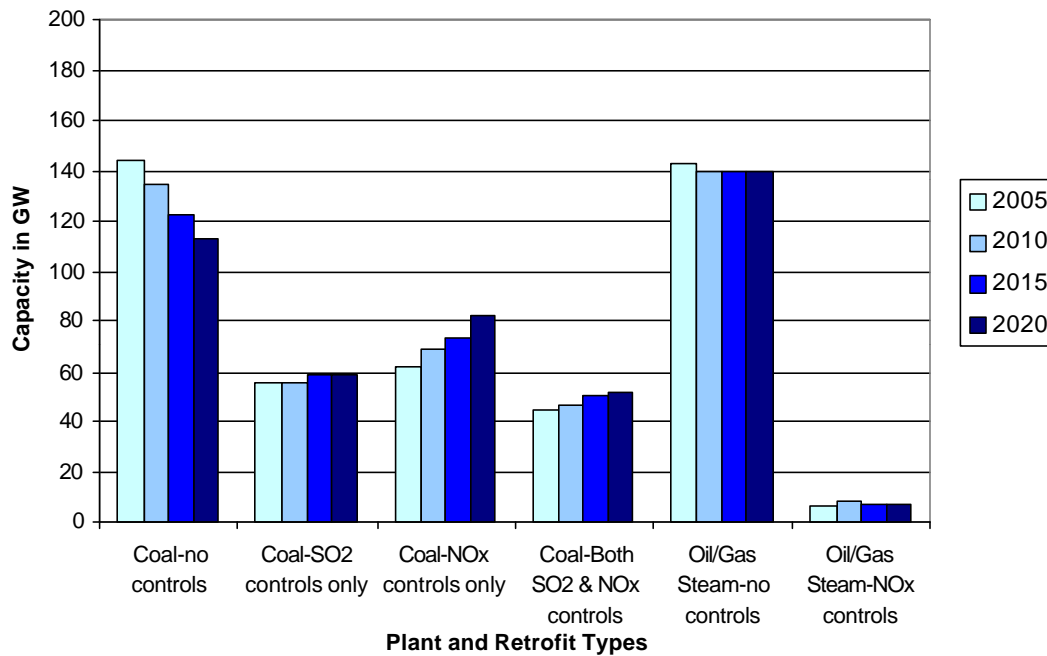
**Figure 9.5. Projected New Generating Capacity
By Technology Type in EPA Base Case 2000**



Emission Control Strategies and Retrofit Patterns: There are basically four ways that the electric system can meet emission limits: (1) shifting generation to less polluting units among the existing stock, (2) fuel switching (e.g., shifting generation from high to low sulfur coal), (3) changing the capacity mix (through capacity additions, repowerings, and retirements) from one type of fuel to another, from less to more efficient units, and from units with limited or no emission controls to new units with more extensive or state-of-the-art controls, and (4) installing emission controls (i.e., environmental retrofits) on existing plants. Capacity trends can shed light on the third and fourth of these options. The previous discussion in this section touched upon the third option (i.e., capacity additions, repowering, and retirements). The remainder of this section examines capacity trends that provide insights in the fourth option by revealing the retrofit patterns in EPA Base Case 2000.

As described in detail in Chapter 5, EPA Base Case 2000 provides a range of post-combustion environmental retrofit options to existing units: three types of scrubbers to reduce sulfur dioxide (SO_2) emissions and three retrofit options — selective catalytic reduction (SCR), selective noncatalytic reduction (SNCR) and gas reburn — to reduce nitrogen oxides (NO_x). Figure 9.6 shows capacity trends for coal and oil/gas steam plants differentiated according to the absence, presence and type of environmental retrofit. The capacity depicted in Figure 9.6 includes both pre-existing and newly installed environmental retrofits that are projected to be in place on existing coal and oil/gas steam plants in each model run year. Figure 9.6 shows a modest but steady increase in the installation of environmental retrofits on coal units. By 2020 63% of the coal capacity is projected to include some form of NO_x or SO_2 environmental retrofit, compared to 53% in 2005. Over the modeling period, there is virtually no change in the oil/gas capacity with NO_x controls.

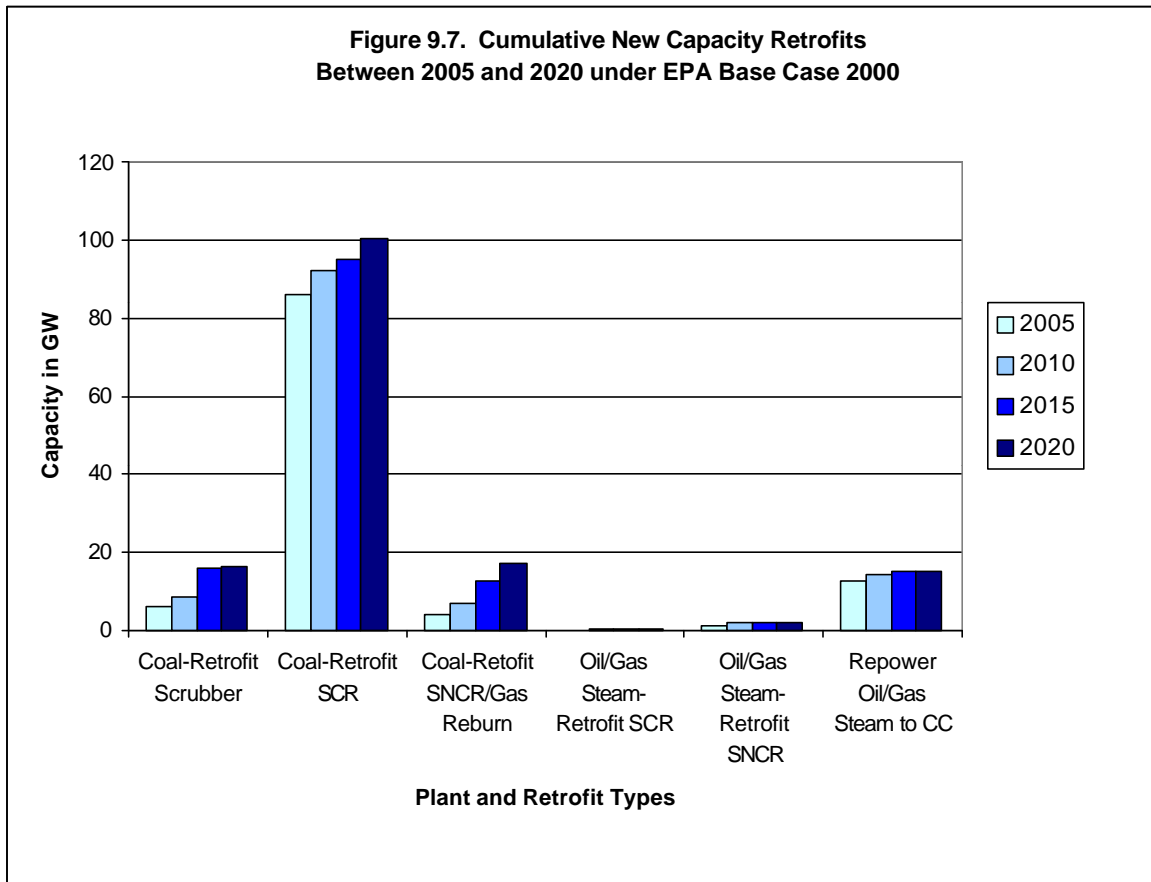
Figure 9.6. Capacity with SO₂ or Post-Combustion NO_x Controls in EPA Base Case 2000



Note: "No controls" and "SO₂ controls only" reflect the absence of post-combustion NO_x controls. NO_x combustion controls may be present to meet Title IV requirements.

Figure 9.7 focuses exclusively on the capacity that is projected to install environmental retrofits over the course of the modeling period. For each model run year, this figure shows the cumulative capacity of existing coal and oil/gas steam plants that are projected to have installed new NO_x or SO₂ controls in response to the environmental air regulations included under EPA Base Case 2000 (as described in Section 3.9). Repowering of oil/gas steam units is also included in the figure, because for some units, repowering is a compliance strategy. While three repowering options (coal to combined cycle, coal to integrated gasification combined cycle, and oil/gas steam to combined cycle) are offered, only the oil/gas steam repowering option is chosen under the EPA Base Case 2000.

As shown in Figure 9.7, SCR is forecasted to be the most widespread new retrofit installed. By 2005 new SCRs are installed on more than 85 GW of coal capacity. By 2020 the cumulative coal capacity with new SCR retrofits is projected to exceed 100 GW. Although there is a gradual increase in the installation of new scrubbers and SNCR, the new capacity taking on either of these retrofits never exceeds 20 GW. However, if both pre-existing and new scrubbers are taken into account, the total capacity operating with scrubbers exceeds 100 GW, rising from 100 GW in 2005 to 109 GW in 2020.



9.2.3 Air Emissions

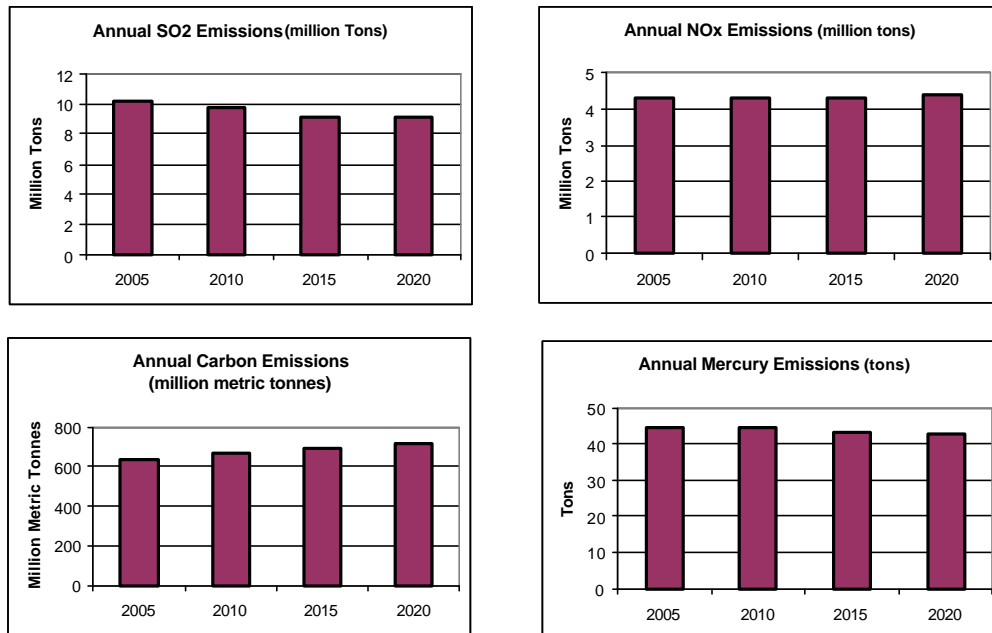
In EPA Base Case 2000, emissions of SO₂ and mercury decline through 2020, while emissions from NO_x and carbon increase over that same time period. Table 9.3 and Figure 9.8 below provide summaries of the national emissions for SO₂, NO_x, carbon and mercury in EPA Base Case 2000 for 2005, 2010, 2015, and 2020.

Table 9.3. National Emission Levels in the EPA Base Case 2000

Pollutant	2005	2010	2015	2020
SO ₂ (million tons)	10.2	9.7	9.1	9.1
NO _x (million tons)	4.3	4.3	4.3	4.4
CO ₂ (million metric tons)	2,316.5	2,428.8	2,536.0	2,634.5
Carbon (million metric tons)	631.8	662.4	691.6	718.5
Mercury (tons) ¹	44.8	44.6	43.3	43.0

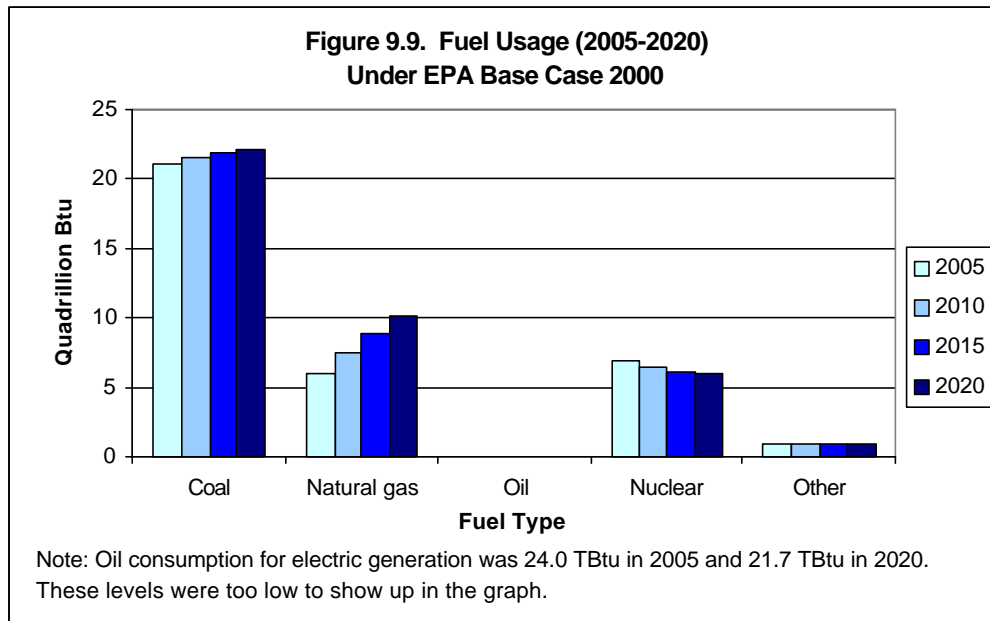
¹ Mercury emissions from coal units greater than 25 MW (which are most likely to be of interest in future policy runs) were projected to be 40.5 tons in 2005 and 2010, 39.0 tons in 2015, and 38.7 tons in 2020.

**Figure 9.8. EPA Base Case 2000 Forecast of Annual Emissions
from Electric Power Generation in the U.S.**



9.2.4 Fuel Usage

Figure 9.9 shows the annual fuel consumption by major fuel type categories on a Btu basis projected under the EPA Base Case 2000. Several observations can be made. First, coal and natural gas are the primary fuels used in the electric sector, accounting for 27.2 quads (i.e., quadrillion Btu) or 78 percent of the 34.9 quads consumed for electricity generation in 2005. By 2020, coal and gas consumption account for 32.4 quads or 83% of all the 39.2 quads used for electricity generation. Second, the consumption of both fuels for electric generation increases steadily over time due to increased electricity demand. Specifically, coal Btu usage increases by 5% and natural gas by 70% between 2005 and 2020. Third, in contrast, nuclear fuel usage declines by 13% from 6.8 quads in 2005 to 5.9 quads in 2020. Fourth, oil consumption for electric generation was 24.0 TBtu in 2005 and 21.7 TBtu in 2020. These levels were too low to show up in Figure 9.9. Fifth, the fuel type category “Other” in Figure 9.9 includes biomass, waste fuels, and landfill gas.



9.2.5 Prices

Firm Wholesale Electricity Prices

The EPA Base Case 2000 includes national and regional projections of wholesale firm electricity prices for 2005 – 2020. The wholesale realized electricity price in the EPA Base Case 2000 is defined as the sum of energy and capacity prices. Since EPA Base Case 2000 assumes a fully operating competitive wholesale market for energy and capacity, the wholesale firm electricity price only includes production costs, but not previously incurred generating facility embedded costs, which typically would be included in modeling cost-of-service pricing in a regulated electricity market.

Figure 9.10 displays the national average wholesale firm electricity price at the generator that results under EPA Base Case 2000. A decline of 5 mills/KWh is forecast between 2005 and 2010, followed by a 1.7 mill/KWh increase through 2020. Average firm wholesale electricity prices for IPM regions are shown in Table 9.4. They vary from 2005 and 2020 lows of 19.0 mills/KWh and 24.2 mills/KWh in NWPE to 2005 and 2020 highs of 55.4 mills/KWh and 41.3 mills/KWh in LILC. The differential between the highest (in the Northeast) and lowest (in the Northwest) regional prices is projected to decline from 36.4 mills/KWh in 2005 to 17.1 mills/KWh in 2020.

**Figure 9.10. National Wholesale Electricity Price
in EPA Base Case 2000**

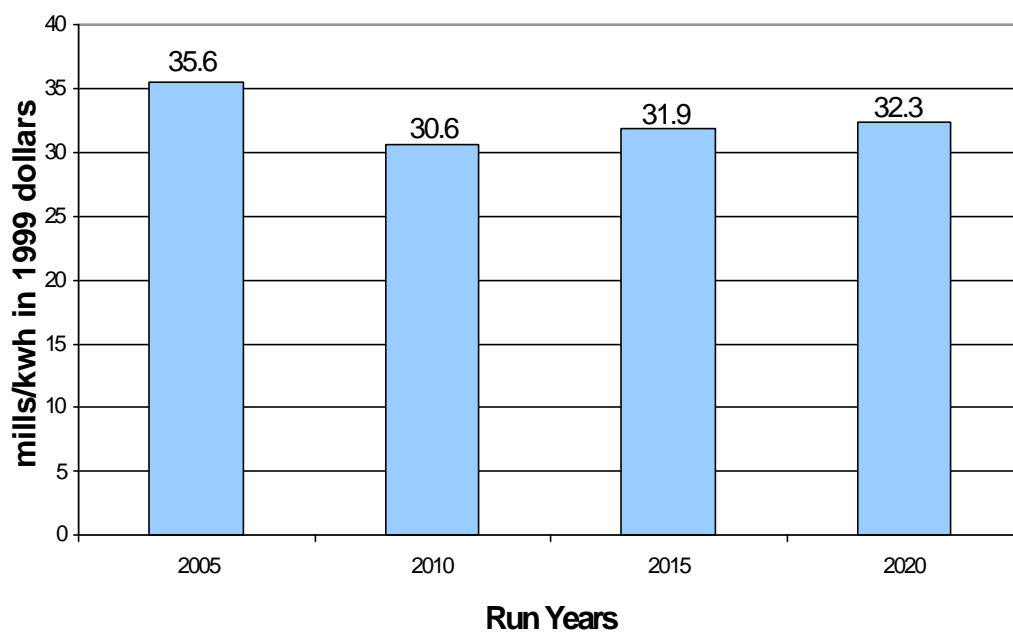


Table 9.4. Wholesale Electricity Prices (mills/kwh) by IPM Region

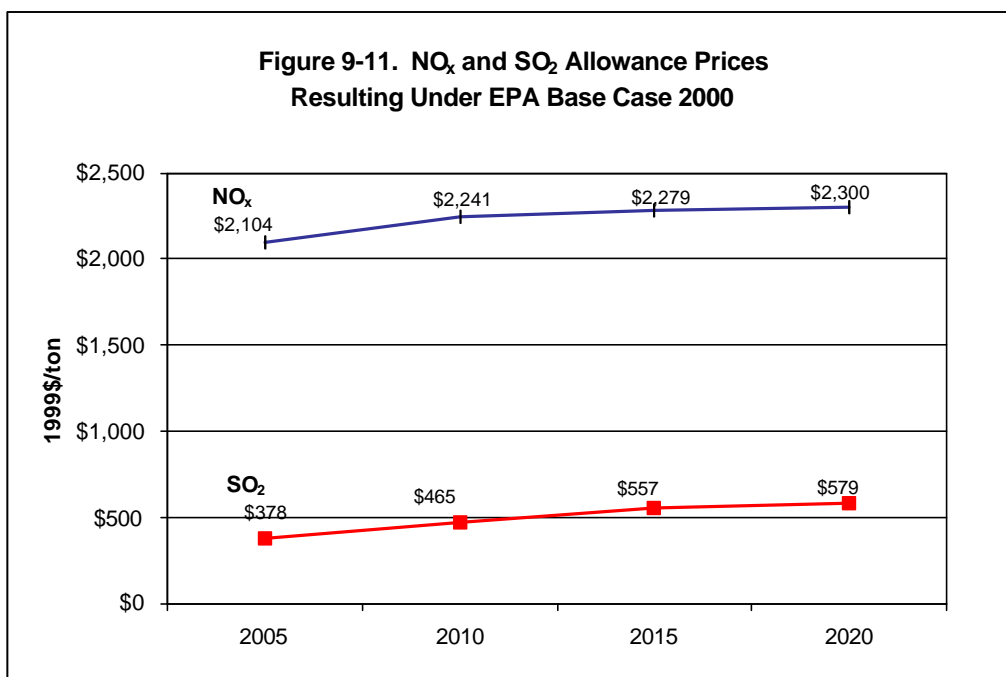
NERC Region	IPM Region	Region Description	Wholesale Cost of Electricity [mills/kwh]			
			2005	2010	2015	2020
ECAR	MECS	Michigan Electric Coordination System	37.6	33.0	34.1	34.4
	ECAO	East Central Area Reliability Coordination Agreement - South	36.0	31.3	32.4	32.7
ERCOT	ERCT	Electric Reliability Council of Texas	26.8	28.9	31.1	31.4
MAAC	MACE	Mid-Atlantic Area Council - East	44.0	37.7	37.9	37.8
	MACW	Mid-Atlantic Area Council - West	36.3	31.9	32.9	33.2
	MACS	Mid-Atlantic Area Council - South	42.8	36.1	36.8	37.1
MAIN	WUMS	Wisconsin-Upper Michigan	40.0	32.1	32.3	32.5
	MANO	Mid-America Interconnected Network – South	39.2	32.6	33.4	33.5
MAPP	MAPP	Mid-continent Area Power Pool	37.3	31.0	30.8	30.8
NPCC	UPNY	Upstate New York	27.3	26.1	26.4	34.7
	DSNY	Downstate New York	42.4	34.8	36.8	37.0
	NYC	New York City	50.5	38.2	39.4	38.8
	LILC	Long Island Lighting Company	55.4	39.4	41.1	41.3
	NENG	New England Power Pool	46.2	36.9	39.6	39.7
FRCC	FRCC	Florida Reliability Coordinating Council	42.1	34.3	34.8	35.2
SERC	VACA	Virginia –Carolinas	38.3	32.9	33.9	34.1
	TVA	Tennessee Valley Authority	37.6	30.9	31.1	31.3
	SOU	Southern Company	38.0	31.3	31.8	32.2
	ENTG	Entergy	38.6	31.4	32.1	32.5
SPP	SPPN	Southwest Power Pool - North	37.5	31.6	32.8	32.9
	SPPS	Southwest Power Pool – South	38.3	31.3	32.1	32.2
WSCC	CALI	Western Systems Coordinating Council – California	29.9	28.4	32.4	32.9
	PNW	Western Systems Coordinating Council - Pacific Northwest	31.1	27.4	28.1	28.6
	AZNM	Western Systems Coordinating Council - AZNMSNV	40.8	32.2	33.6	34.1
	RMPA	Western Systems Coordinating Council - Rocky Mountain Power Area	20.0	20.6	27.7	27.8
	NWPE	Western Systems Coordinating Council - Northwest Power Pool East	19.0	19.3	22.7	24.2
National			35.6	30.6	31.9	32.3

Notes: The capacity price in \$/kW-yr is translated to mills/kWh using respective regional load factors.

Allowance Prices

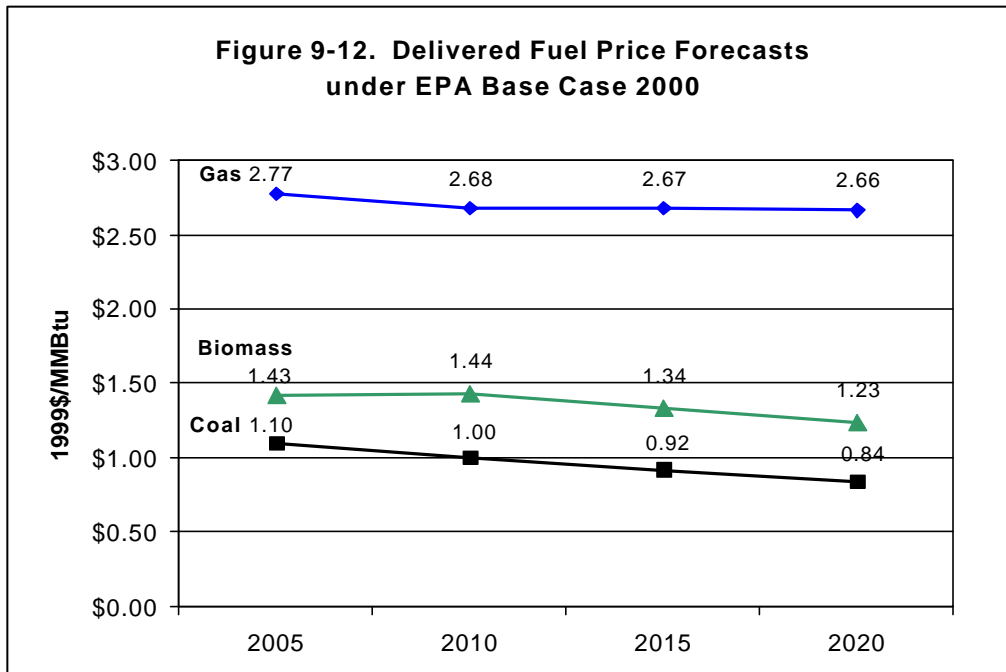
The EPA Base Case 2000 also includes projections of allowance prices for pollutants regulated under cap-and-trade programs. The allowance prices are obtained endogenously by IPM in the course of deriving an economically optimal response to the emission limits contained in EPA Base Case 2000. They are the “shadow prices” associated with the NO_x and SO₂ emission constraints and indicate the cost of an additional ton reduction of NO_x or SO₂. An allowance price represents the marginal compliance cost under a cap-and-trade program.

Figure 9.11 below shows the NO_x and SO₂ allowance prices in the EPA Base Case 2000 for the NO_x SIP CALL and Title IV SO₂ trading programs.



Fuel Prices

The EPA Base Case 2000 also includes projections of coal, gas and biomass fuel prices for 2005 – 2020. Coal, gas and biomass fuel prices are endogenously determined in the IPM and reflect the supply curve assumptions and resulting demand in the EPA Base Case 2000. Figure 9.12 below provides a summary of the coal, gas and biomass delivered fuel prices in the EPA Base Case 2000. Prices of other fuels are not determined endogenously, but, as described in sections 8.3 and 8.5, they are stipulated exogenously .



9.3 Detailed Outputs

This section provides detailed model results for EPA Base Case 2000. Among other information, this section includes a system level summary of results (Table 9.5) and national-level projections of electric capacity, generation and capacity factors by key plant types and emission control technologies (Tables 9.7 - 9.10). Disaggregated breakdowns by regions and technologies are included for 2010 (Tables 9.11 and 9.12), 2015 (Tables 9.13 and 9.14), 2015 (Tables 9.15 and 9.16), and 2020 (Tables 9.17 and 9.18). These breakdowns cover electric generation, fuel usage, and emissions for NO_x, SO₂, mercury, CO₂ and carbon by NERC region and plant type in the EPA Base Case 2000². Table 9.6 provides a key to the abbreviations used to identify model plants in Tables 9.7 - 9.10.

²Breakdowns of this information by the 26 model regions can be found in the "RPE" output file which IPM produces.

Table 9.5. EPA Base Case 2000 — System Summary

	2005	2010	2015	2020
1. Reserve Margin Capacity [MW]	831,903	868,695	926,098	976,254
Plus Firm Purchases [MW]	0	0	0	0
Plus Transmission In [MW]	25,817	27,338	26,113	24,911
Total Reserve Margin Capacity [MW]	857,720	896,033	952,211	1,001,165
2. Peak Load [MW]	719,442	761,387	812,269	856,657
Less DSM [MW]	0	0	0	0
Plus Firm Sales [MW]	0	0	0	0
Plus Transmission Out [MW]	26,344	27,896	26,646	25,420
Net Demand [MW]	745,786	789,283	838,915	882,077
3. Reserve Margin [%]	15	14	14	14
4. Generation [GWh]	3,949,543	4,146,158	4,391,879	4,599,318
Inter-Region Transmission [GWh]	-9,134	-8,865	-8,181	-8,160
Pumping & Storage Losses [GWh]	13,911	15,104	15,049	14,937
Plus Purchases [GWh]	0	0	0	0
Less Sales [GWh]	0	0	0	0
5. Total Supply for Demand [GWh]	3,926,498	4,122,190	4,368,648	4,576,221
6. Projected Demand [GWh]	3,926,498	4,122,190	4,368,648	4,576,221
Energy Not Served [GWh]	0	0	0	0
Less DSM [GWh]	0	0	0	0
Net Demand [GWh]	3,926,498	4,122,190	4,368,648	4,576,221
7. Dumped Energy [GWh]	0	0	0	0
Capacity Avoided Costs [US\$/kW/a]	58	34	42	44

Notes

1. "Reserve Margin Capacity [MW]" is the amount of power plant capacity available to satisfy the power system's reserve margin requirements.
2. "Transmission In [MW]" is the total capacity imported by regions in the system.
3. "Transmission Out [MW]" is the total capacity exported by regions in the system.
4. "Reserve Margin [%]" is the percentage of capacity reserved over and above peak load to maintain the reliability of the power system. Reserve Margin (%) = [Total Reserve Margin Capacity (in No.1) minus Net Demand (in No.2)], divided by Net Demand (in No.2).
5. "Inter-Regional Transmission [GWh]" is the energy lost during the process of transmitting power over high-voltage lines between regions.
6. "Pumping and Storage Losses [GWh]" is the energy lost to pump and store water in pump storage plants.
7. "Total Supply for Demand [GWh]" is the amount of electricity available to meet electricity demand.
8. "Capacity Avoided Cost [US\$/kW/a]" is the shadow price associated with the reserve margin constraint. It is the price attributable to the electricity system's reliability requirements.
9. "Firm Purchases [MW]," "Peak Load [MW]," "DSM (demand side management) [MW]," "Firm Sales [MW]," and "Projected Demand [GWh]" are inputs to the model. The remaining terms shown in Table 9.5 are model outputs.

Table 9.6. Key to Plant Type Abbreviations Used in EPA Base Case 2000

Plant Name	ID	Description
Scrubbed Coal_NOx	1	Existing coal plant with both a scrubber and post-combustion NO _x controls
Scrubbed Coal	2	Existing coal plant with a scrubber but without post-combustion NO _x controls
Unscrubbed Coal_NOx	3	Existing coal plant without a scrubber but with post-combustion NO _x controls
Unscrubbed Coal	4	Existing coal plant without a scrubber and without post-combustion NO _x controls
Oil/Gas Steam	5	Oil/Gas Steam plant without post-combustion NO _x controls
Oil/Gas Steam_No _x	6	Oil/Gas Steam plant with post-combustion NO _x controls
Nuclear	7	Nuclear
Hydro	8	Hydro
Comb.Cycle Gas	9	Comb.Cycle Gas (CC)
IGCC	10	Integrated coal gasification combined cycle
Turbine	11	Combustion Turbine (CT)
Biomass	12	Biomass Gasification Combined Cycle
Geothermal	13	Geothermal
Landfill Gas	14	Landfill Gas
Wind	15	Wind
Fuel Cell	16	Fuel Cell
Solar	17	Photovoltaic and solar thermal
Non Fossil_Other	18	Refuse, Bagasse, Municipal Solid Waste, Paper Pellets, Sludge Waste, Tires, Waste Heat, Liquid Acetonitrile Waste, Batteries
Fossil_Other	19	Waste Coal, Petroleum Coke, Digester Gas, Waste Oil
Pump Storage	20	Pump Storage
Int. Imports	21	International imports
Cgn_Coal	22	Coal burning cogenerators
Cgn_Gas	23	Gas burning cogenerators
Cgn_Oil	24	Oil burning cogenerators
Cgn_Other	25	Cogenerators that do not fall in 22-24
NonCG IPP_Coal	26	No units in current NEEDS that fall in this category (CHP Expansion Field).
NonCG IPP_Gas	27	No units in current NEEDS that fall in this category (CHP Expansion Field).
NonCG IPP_Other	28	No units in current NEEDS that fall in this category (CHP Expansion Field).
Blr_Coal	29	No units in current NEEDS that fall in this category (CHP Expansion Field).
Blr_Gas	30	No units in current NEEDS that fall in this category (CHP Expansion Field).
Blr_Oil	31	No units in current NEEDS that fall in this category (CHP Expansion Field).
Blr_Other	32	No units in current NEEDS that fall in this category (CHP Expansion Field).
SteamOnly Cogen	33	No units in current NEEDS that fall in this category (CHP Expansion Field).
Rep.Coal-CC	34	Coal plant repowered to combined cycle gas
Rep.O/G-CC	35	Oil/Gas steam plant repowered to combined cycle gas
Rep.Coal-IGCC	36	Coal plant repowered to IGCC
Ret.Scrubber	37	Coal plant retrofitted with a Scrubber <i>only</i>
Ret.ExistSCR & Scrub	38	Coal plant with an existing SCR retrofit with a scrubber
Ret.ExistSNCR & Scrub	39	Coal plant with an existing SNCR retrofit with a scrubber
Ret.SCR	40	Coal plant retrofitted with an SCR <i>only</i>
Ret.ExistScrub & SCR	41	Coal plant with an existing scrubber retrofit with SCR
Ret.SNCR	42	Coal plant retrofitted with an SNCR <i>only</i>
Ret.ExistScrub & SNCR	43	Coal plant with an existing scrubber retrofit with SNCR
Ret.SCR+Scrb	44	Coal plant retrofitted with both an SCR & a Scrubber
Ret.SNCR+Scrub	45	Coal plant retrofitted with both an SNCR & a Scrubber
Ret.Gas Reburn	46	Coal plant retrofitted with the Gas Reburn NO _x control technology
Ret.ExistScrub+GasR	47	Coal plant with an existing scrubber retrofit with gas reburn
Ret.GasReburn+Scrub	48	Coal plant retrofitted with both gas reburn & a Scrubber
Ret.ACI	49	Coal plant retrofitted with activated carbon injection (ACI) <i>only</i>

Plant Name	ID	Description
Ret.ExistScrub&ACI	50	Coal plant with an existing scrubber retrofit with ACI
Ret.ExistSCR&ACI	51	Coal plant with an existing SCR retrofit with ACI
Ret.ExistSNCR&ACI	52	Coal plant with an existing SNCR retrofit with ACI
Ret.ACI & SCR	53	Coal plant retrofitted with both ACI and SCR
Ret.ExistScrub&ACI&SCR	54	Coal plant with an existing scrubber retrofit with both ACI and SCR
Ret.ACI & SNCR	55	Coal plant retrofitted with both ACI and SNCR
Ret.ExistScrub&ACI&SNCR	56	Coal plant with an existing scrubber retrofit with both ACI and SNCR
Ret.ACI & Scrub	57	Coal plant retrofitted with both ACI and a scrubber
Ret.ExistSCR&ACI&Scrub	58	Coal plant with an existing SCR retrofit with both ACI and a scrubber
Ret.ExistSNCR&ACI&Scrub	59	Coal plant with an existing SNCR retrofit with both ACI and a scrubber
Ret.ExistSNCR&ExistScrub &ACI	60	Coal plant with both existing SNCR and an existing scrubber retrofit with ACI
Ret.ExistSCR&ExistScrub&ACI	61	Coal plant with both existing SCR and an existing scrubber retrofit with ACI
Ret.ExistNOx&ExistScrub&ACI	62	Coal plant with existing post-combustion NO _x controls and an existing scrubber retrofit with ACI
Ret.SCR & Scrub & ACI	63	Coal plant retrofitted with SCR, a scrubber, and ACI
Ret.SNCR & Scrub & ACI	64	Coal plant retrofitted with SNCR, a scrubber, and ACI
Ret.O/G SCR	65	O&G plant retrofitted with an SCR <i>only</i>
Ret.O/G SNCR	66	O&G plant retrofitted with an SNCR <i>only</i>
Ret.Nuclear (age 30+10 yrs)	67	Nuclear plant retrofitted for 10 years at age 30
Ret.Nuclear (age 40+20 yrs)	68	Nuclear plant relicensed for 20 years at age 40
Ret. Biomass Cofiring	69	Coal plant cofiring biomass
CT Early Retirement	70	Combustion Turbine Early Retirement
CC Early Retirement	71	Combined Cycle Gas Early Retirement
O/G Early Retirement	72	Oil/Gas Steam Early Retirement
Coal Early Retirement	73	Coal Early Retirement
Nuke Early Retirement	74	Nuclear Early Retirement

Notes

1. The "early retirement" model plants types (types 70-74) indicate the capacity that is endogenously retired by the model, because they are not economical to remain operating. Such plants do not carry any cost, whereas a plant not dispatched (but not retired) would incur fixed operations and maintenance (FOM) costs.

2. The "Exist" designation (e.g., ExistSCR) implies that the indicated technology was present at start-up of the model. That is, the technology was on an existing plant. The "Exist" designation is not used to identify a technology installed by the model even when a second retrofit is installed in a subsequent model run year. For example, a plant that has SCR at start up of the model and is subsequently retrofit by the model with a scrubber would be represented by model plant type 38 (Ret.ExistSCR & Scrub). On the other hand, a plant that was retrofit by the model with SCR in 2005 and with a scrubber in 2010 would be represented by model plant type 44 (Ret.SCR+Scrb).

3. Plant type 62 (Ret.ExistNOx&ExistScrub&ACI) represents all plants with an existing scrubber and some form of existing post-combustion NO_x controls other than SCR or SNCR (e.g., gas reburn) that are retrofit with ACI. There is no double counting with plant types 60 (Ret.ExistSNCR&ExistScrub&ACI) or 61 (Ret.ExistSCR&ExistScrub&ACI).

Table 9.7. Capacity (MW) by Plant Type in EPA Base Case 2000

Plant Type	2005	2010	2015	2020
Scrubbed Coal_NOx	4,942	4,942	4,942	4,942
Scrubbed Coal	51,946	50,393	50,393	50,249
Unscrubbed Coal_NOx	9,201	9,201	9,201	8,595
Unscrubbed Coal	139,419	130,486	118,473	108,574
Oil/Gas Steam	118,936	116,386	116,386	116,386
Oil/Gas Steam_NOx	5,024	5,024	4,463	4,374
Nuclear	77,236	61,238	31,297	10,725
Hydro	89,788	89,788	89,788	89,788
Comb.Cycle Gas	79,307	101,493	128,110	152,806
IGCC	612	612	612	612
Turbine	96,495	117,492	151,378	180,896
Biomass	1,108	1,108	1,108	1,108
Geothermal	2,725	2,725	2,725	2,725
Landfill Gas	91	91	91	91
Wind	1,691	1,691	1,691	1,691
Fuel Cell	0	0	0	0
Solar	325	325	325	325
Non Fossil_Other	2,112	2,112	2,112	2,112
Fossil_Other	45	45	45	45
Pump Storage	22,554	22,554	22,554	22,554
Int. Imports	11,000	11,000	11,000	11,000
Cgn_Coal	4,062	3,998	3,998	3,994
Cgn_Gas	22,540	22,540	22,540	22,540
Cgn_Oil	1,069	1,069	1,069	1,069
Cgn_Other	1,063	1,063	1,063	1,063
Rep.Coal-CC	0	0	0	0
Rep.O/G-CC	12,886	14,171	15,293	15,472
Rep.Coal-IGCC	0	0	0	0
Ret.Scrubber	3,532	5,412	8,216	8,216
Ret.ExistSCR & Scrub	1,900	1,900	1,900	2,494
Ret.ExistSNCR & Scrub	0	0	0	0
Ret.SCR	49,517	54,291	53,303	58,852
Ret.ExistScrub & SCR	35,668	36,697	36,697	36,697
Ret.SNCR	2,974	5,039	10,858	15,211
Ret.ExistScrub & SNCR	1,191	1,716	1,716	1,860
Ret.SCR+Scrub	957	1,189	5,179	5,179
Ret.SNCR+Scrub	0	0	238	238
Ret.Gas Reburn	0	0	0	0
Ret.ExistScrub+GasR	0	0	0	0
Ret.GasReburn+Scrub	0	0	0	0
Ret.ACI	0	0	0	0
Ret.ExistScrub&ACI	0	0	0	0
Ret.ExistSCR&ACI	0	0	0	0
Ret.ExistSNCR&ACI	0	0	0	0
Ret.ACI & SCR	0	0	0	0
Ret.ExistScrub&ACI&SCR	0	0	0	0
Ret.ACI & SNCR	0	0	0	0
Ret.ExistScrub&ACI&SNCR	0	0	0	0
Ret.ACI & Scrub	0	0	0	0
Ret.ExistSCR&ACI&Scrub	0	0	0	0
Ret.ExistSNCR&ACI&Scrub	0	0	0	0
Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0
Ret.ExistSCR&ExistScrub&ACI	0	0	0	0
Ret.ExistNOx&ExistScrub&ACI	0	0	0	0
Ret.SCR & Scrub & ACI	0	0	0	0
Ret.SNCR & Scrub & ACI	0	0	0	0
Ret.O/G SCR	0	506	506	506
Ret.O/G SNCR	1,225	2,303	2,303	2,303
Ret.Nuclear (age 30+10 yrs)	9,278	16,550	26,102	33,556
Ret.Nuclear (age 40+20 yrs)	0	2,062	18,940	27,924
Ret. Biomass Cofiring	0	0	0	0
CT Early Retirement	0	0	0	0
CC Early Retirement	0	0	0	0
O/G Early Retirement	1,234	1,557	1,557	1,557
Coal Early Retirement	0	0	0	0
Nuke Early Retirement	2,248	4,776	1,140	1,140
Total	865,901	905,545	959,312	1,009,469

(**) Ind. Boiler capacity in MMBtu/hr, not included in the total

Table 9.8. Capacity Additions and Changes (MW) by Plant Type in EPA Base Case 2000

	2005	2010	2015	2020
Scrubbed Coal_NOx	0	0	0	0
Scrubbed Coal	0	0	0	0
Unscrubbed Coal_NOx	0	0	0	0
Unscrubbed Coal	0	0	0	0
Oil/Gas Steam	0	0	0	0
Oil/Gas Steam_NOx	0	0	0	0
Nuclear	0	0	0	0
Hydro	0	0	0	0
Comb.Cycle Gas	20,493	22,186	26,618	24,695
IGCC	0	0	0	0
Turbine	22,761	20,997	33,886	29,518
Biomass	0	0	0	0
Geothermal	0	0	0	0
Landfill Gas	0	0	0	0
Wind	0	0	0	0
Fuel Cell	0	0	0	0
Solar	0	0	0	0
Non Fossil_Other	0	0	0	0
Fossil_Other	0	0	0	0
Pump Storage	0	0	0	0
Int. Imports	0	0	0	0
Cgn_Coal	0	0	0	0
Cgn_Gas	0	0	0	0
Cgn_Oil	0	0	0	0
Cgn_Other	0	0	0	0
Rep.Coal-CC	0	0	0	0
Rep.O/G-CC	12,886	1,285	1,122	179
Rep.CoalHGCC	0	0	0	0
Ret.Scrubber	4,489	1,880	3,815	0
Ret.ExistSCR & Scrub	1,900	0	0	593
Ret.ExistSNCR & Scrub	0	0	0	0
Ret.SCR	49,517	5,012	2,297	5,549
Ret.ExistScrub & SCR	35,668	1,029	0	0
Ret.SNCR	2,974	2,065	5,819	4,353
Ret.ExistScrub & SNCR	1,191	525	0	144
Ret.SCR+Scrb	957	233	3,990	0
Ret.SNCR+Scrub	0	0	238	0
Ret.Gas Reburn	0	0	0	0
Ret.ExistScrub+GasR	0	0	0	0
Ret.GasReburn+Scrub	0	0	0	0
Ret.ACI	0	0	0	0
Ret.ExistScrub&ACI	0	0	0	0
Ret.ExistSCR&ACI	0	0	0	0
Ret.ExistSNCR&ACI	0	0	0	0
Ret.ACI & SCR	0	0	0	0
Ret.ExistScrub&ACI&SCR	0	0	0	0
Ret.ACI & SNCR	0	0	0	0
Ret.ExistScrub&ACI&SNCR	0	0	0	0
Ret.ACI & Scrub	0	0	0	0
Ret.ExistSCR&ACI&Scrub	0	0	0	0
Ret.ExistSNCR&ACI&Scrub	0	0	0	0
Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0
Ret.ExistSCR&ExistScrub&ACI	0	0	0	0
Ret.ExistNOx&ExistScrub&ACI	0	0	0	0
Ret.SCR & Scrub & ACI	0	0	0	0
Ret.SNCR & Scrub & ACI	0	0	0	0
Ret.O/G SCR	0	506	0	0
Ret.O/G SNCR	1,225	1,078	0	0
Ret.Nuclear (age 30+10 yrs)	9,278	7,272	18,830	14,726
Ret.Nuclear (age 40+20 yrs)	0	2,062	16,878	8,984
Ret. Biomass Cofiring	0	0	0	0
CT Early Retirement	0	0	0	0
CC Early Retirement	0	0	0	0
O/G Early Retirement	1,234	324	0	0
Coal Early Retirement	0	0	0	0
Nuke Early Retirement	2,248	2,528	0	0
Total	166,820	68,982	113,492	88,742

(**) Ind. Boiler capacity in MMBtu/hr, not included in the total

Table 9.9 Generation (GWh) by Plant Type in EPA Base Case 2000

	2005	2010	2015	2020
Scrubbed Coal_NOx	36,717	36,717	36,717	36,800
Scrubbed Coal	378,345	369,654	371,460	372,216
Unscrubbed Coal_NOx	61,756	64,696	64,633	60,839
Unscrubbed Coal	919,429	883,278	823,718	772,330
Oil/Gas Steam	102,185	88,360	63,741	52,168
Oil/Gas Steam_NOx	23,231	19,702	15,109	5,454
Nuclear	574,690	463,605	237,196	80,308
Hydro	269,195	269,195	269,195	269,195
Comb.Cycle Gas	461,789	624,828	816,614	994,339
IGCC	4,702	4,702	4,702	4,702
Turbine	44,138	83,402	159,041	214,991
Biomass	7,476	7,486	7,291	7,152
Geothermal	20,767	20,767	20,767	20,767
Landfill Gas	717	717	717	717
Wind	4,319	4,319	4,319	4,319
Fuel Cell	0	0	0	0
Solar	791	791	791	791
Non Fossil_Other	16,651	16,651	16,651	16,651
Fossil_Other	355	355	355	355
Pump Storage	10,343	11,199	11,165	11,088
Int. Imports	49,012	32,473	33,419	27,261
Cgn_Coal	28,046	28,118	28,426	28,559
Cgn_Gas	58,228	71,538	59,645	57,542
Cgn_Oil	3,234	3,234	2,954	2,937
Cgn_Other	6,893	6,893	7,187	7,070
Rep.Coal-CC	0	0	0	0
Rep.O/G-CC	98,867	109,858	117,908	118,949
Rep.Coal-IGCC	0	0	0	0
Ret.Scrubber	26,301	40,298	60,804	61,176
Ret.ExistSCR & Scrub	14,150	14,150	14,150	18,569
Ret.ExistSNCR & Scrub	0	0	0	0
Ret.SCR	354,464	392,563	388,077	431,794
Ret.ExistScrub & SCR	263,688	271,350	269,972	270,330
Ret.SNCR	19,523	34,096	75,388	107,324
Ret.ExistScrub & SNCR	8,244	12,153	12,391	13,463
Ret.SCR+Scrb	7,122	8,857	38,564	38,564
Ret.SNCR+Scrub	0	0	1,771	1,771
Ret.Gas Reburn	0	0	0	0
Ret.ExistScrub+GasR	0	0	0	0
Ret.GasReburn+Scrub	0	0	0	0
Ret.ACI	0	0	0	0
Ret.ExistScrub&ACI	0	0	0	0
Ret.ExistSCR&ACI	0	0	0	0
Ret.ExistSNCR&ACI	0	0	0	0
Ret.ACI & SCR	0	0	0	0
Ret.ExistScrub&ACI&SCR	0	0	0	0
Ret.ACI & SNCR	0	0	0	0
Ret.ExistScrub&ACI&SNCR	0	0	0	0
Ret.ACI & Scrub	0	0	0	0
Ret.ExistSCR&ACI&Scrub	0	0	0	0
Ret.ExistSNCR&ACI&Scrub	0	0	0	0
Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0
Ret.ExistSCR&ExistScrub&ACI	0	0	0	0
Ret.ExistNOx&ExistScrub&ACI	0	0	0	0
Ret.SCR & Scrub & ACI	0	0	0	0
Ret.SNCR & Scrub & ACI	0	0	0	0
Ret.O/G SCR	0	533	508	400
Ret.O/G SNCR	1,291	2,226	3,430	3,102
Ret.Nuclear (age 30+10 yrs)	72,883	131,844	205,568	264,786
Ret.Nuclear (age 40+20 yrs)	0	15,550	147,534	220,537
Ret. Biomass Cofiring	0	0	0	0
Total	3,949,544	4,146,158	4,391,878	4,599,318

(**) Ind. Boiler generation, not included in the total

Table 9.10. Capacity Factors (%) by Plant Type in EPA Base Case 2000

	2005	2010	2015	2020
Scrubbed Coal_NOx	85	85	85	85
Scrubbed Coal	83	84	84	85
Unscrubbed Coal_NOx	77	80	80	81
Unscrubbed Coal	75	77	79	81
Oil/Gas Steam	10	9	6	5
Oil/Gas Steam_NOx	53	45	39	14
Nuclear	85	86	87	86
Hydro	34	34	34	34
Comb.Cycle Gas	67	70	73	74
IGCC	88	88	88	88
Turbine	5	8	12	14
Biomass	77	77	75	74
Geothermal	87	87	87	87
Landfill Gas	90	90	90	90
Wind	29	29	29	29
Fuel Cell	N/A	N/A	N/A	N/A
Solar	28	28	28	28
Non Fossil_Other	90	90	90	90
Fossil_Other	90	90	90	90
Pump Storage	5	6	6	6
Int. Imports	51	34	35	28
Cgn_Coal	79	80	81	82
Cgn_Gas	30	36	30	29
Cgn_Oil	35	35	32	31
Cgn_Other	74	74	77	76
Rep.Coal-CC	N/A	N/A	N/A	N/A
Rep.O/G-CC	88	89	88	88
Rep.Coal-IGCC	N/A	N/A	N/A	N/A
Ret.Scrubber	85	85	85	85
Ret.ExistSCR & Scrub	85	85	85	85
Ret.ExistSNCR & Scrub	N/A	N/A	N/A	N/A
Ret.SCR	82	83	83	84
Ret.ExistScrub & SCR	84	84	84	84
Ret.SNCR	75	77	79	81
Ret.ExistScrub & SNCR	79	81	82	83
Ret.SCR+Scrb	85	85	85	85
Ret.SNCR+Scrub	N/A	N/A	85	85
Ret.Gas Reburn	N/A	N/A	N/A	N/A
Ret.ExistScrub+GasR	N/A	N/A	N/A	N/A
Ret.GasReburn+Scrub	N/A	N/A	N/A	N/A
Ret.ACI	N/A	N/A	N/A	N/A
Ret.ExistScrub&ACI	N/A	N/A	N/A	N/A
Ret.ExistSCR&ACI	N/A	N/A	N/A	N/A
Ret.ExistSNCR&ACI	N/A	N/A	N/A	N/A
Ret.ACI & SCR	N/A	N/A	N/A	N/A
Ret.ExistScrub&ACI&SCR	N/A	N/A	N/A	N/A
Ret.ACI & SNCR	N/A	N/A	N/A	N/A
Ret.ExistScrub&ACI&SNCR	N/A	N/A	N/A	N/A
Ret.ACI & Scrub	N/A	N/A	N/A	N/A
Ret.ExistSCR&ACI&Scrub	N/A	N/A	N/A	N/A
Ret.ExistSNCR&ACI&Scrub	N/A	N/A	N/A	N/A
Ret.ExistSNCR&ExistScrub&ACI	N/A	N/A	N/A	N/A
Ret.ExistSCR&ExistScrub&ACI	N/A	N/A	N/A	N/A
Ret.ExistNOx&ExistScrub&ACI	N/A	N/A	N/A	N/A
Ret.SCR & Scrub & ACI	N/A	N/A	N/A	N/A
Ret.SNCR & Scrub & ACI	N/A	N/A	N/A	N/A
Ret.O/G SCR	N/A	12	12	9
Ret.O/G SNCR	12	11	17	15
Ret.Nuclear (age 30+10 yrs)	90	91	90	90
Ret.Nuclear (age 40+20 yrs)	N/A	86	89	90
Ret. Biomass Cofiring	N/A	N/A	N/A	N/A
CT Early Retirement	N/A	N/A	N/A	N/A
CC Early Retirement	N/A	N/A	N/A	N/A
O/G Early Retirement	0	0	0	0
Coal Early Retirement	N/A	N/A	N/A	N/A
Nuke Early Retirement	0	0	0	0
Average	52	52	52	52

(**) Ind. Boilers not included in the average

Table 9.11. EPA Base Case 2000 Regional Emissions Summary in 2005

NERC Region	Generation (GWh)			Fuel Use (TBtu)			NO _x Emissions (MTons)			SO ₂ Emissions (MTons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ¹	Summer ²	Total	Winter ¹	Summer ²	Total	Total	Total	Total	Total
ECAR	369,053	270,553	639,606	3,498	2,555	6,053	762	165	927	2,947	9	518	141
ERCT	159,737	146,120	305,858	1,407	1,312	2,719	105	104	209	497	2	169	46
MAAC	151,450	114,637	266,087	1,444	1,082	2,526	181	47	228	898	5	126	34
MAIN	155,916	119,782	275,698	1,561	1,187	2,748	254	135	388	1,004	4	192	52
MAPP	101,546	79,238	180,784	995	775	1,771	210	163	373	631	4	147	40
NPCC	165,046	123,621	288,666	1,051	802	1,853	65	38	103	339	2	96	26
FRCC	91,692	84,591	176,283	833	771	1,604	102	96	198	237	1	95	26
SERC	496,307	387,097	883,403	4,579	3,626	8,205	635	346	981	2,622	9	496	135
SPP	112,601	100,034	212,635	1,039	937	1,977	177	150	327	513	4	164	45
WSCC	406,934	313,591	720,523	3,074	2,328	5,403	305	237	542	478	6	312	85
System Total	2,210,278	1,739,264	3,949,547	19,482	15,376	34,858	2,796	1,481	4,277	10,169	45	2,316	632

¹ Summer months include May-September

² Winter months include October-April

Table 9.12. EPA Base Case 2000 Technology Emissions Summary in 2005

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ¹	Summer ²	Total	Winter ¹	Summer ²	Total	Total	Total	Total	Total
Total Scrubbed Coal_NO _x	20,510	16,207	36,717	196	154	350	60	22	82	36	0	33	9
Total Scrubbed Coal	213,151	165,194	378,345	2,211	1,712	3,923	448	347	795	641	6	372	101
Total Unscrubbed Coal_NO _x	37,346	24,410	61,756	359	234	592	92	20	112	490	2	55	15
Total Unscrubbed Coal	540,282	379,147	919,429	5,441	3,812	9,252	1,114	772	1,885	5,656	22	877	239
Total Oil/Gas Steam	32,103	70,082	102,185	314	691	1,006	31	80	111	13	0	54	15
Total Oil/Gas Steam_NO _x	18,482	4,749	23,231	176	45	221	1	0	2	1	0	12	3
Total Nuclear	328,388	246,302	574,690	3,458	2,597	6,055	0	0	0	0	0	0	0
Total Hydro	154,335	114,860	269,195	0	0	0	0	0	0	0	0	0	0
Total Comb.Cycle Gas	251,443	210,346	461,789	1,727	1,467	3,194	73	65	138	0	0	170	46
Total IGCC	2,652	2,050	4,702	19	15	34	1	1	2	0	0	3	1
Total Turbine	14,291	29,847	44,138	146	311	457	8	17	25	0	0	24	7
Total Biomass	4,613	2,863	7,476	43	26	69	0	0	1	3	0	0	0
Total Geothermal	11,600	9,168	20,767	299	237	536	0	0	0	0	2	0	0
Total Landfill Gas	407	310	717	4	3	8	1	0	1	0	0	0	0
Total Wind	2,768	1,552	4,319	0	0	0	0	0	0	0	0	0	0
Total Fuel Cell	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Solar	517	274	791	0	0	0	0	0	0	0	0	0	0
Total Non Fossil_Other	9,309	7,342	16,651	102	81	183	0	0	0	0	1	0	0
Total Fossil_Other	201	153	355	2	2	4	1	1	1	0	0	0	0
Total Pump Storage	5,255	5,088	10,343	0	0	0	0	0	0	0	0	0	0
Total Int. Imports	28,467	20,545	49,012	0	0	0	0	0	0	0	0	0	0
Total Cgn_Coal	16,013	12,033	28,046	145	109	254	28	21	49	129	1	24	6
Total Cgn_Gas	28,157	30,071	58,228	239	253	491	11	13	24	0	0	26	7
Total Cgn_Oil	1,786	1,448	3,234	14	11	25	0	0	0	0	0	1	0
Total Cgn_Other	3,969	2,925	6,893	27	20	47	1	1	2	1	0	0	0
Total NonCG IPP_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Oil	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SteamOnly Cogen	0	0	0	0	0	0	0	0	0	0	0	0	0

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Rep.Coal-CC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Rep.O/G-CC	55,035	43,831	98,867	364	290	653	4	3	7	0	0	35	9
Total Rep.Coal-IGCC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.Scrubber	14,659	11,642	26,301	144	114	258	30	24	54	26	0	24	7
Total Ret.ExistSCR & Scrub	7,886	6,264	14,150	80	64	144	18	1	20	14	0	13	4
Total Ret.ExistSNCR & Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR	197,161	157,303	354,464	1,854	1,480	3,334	500	43	543	2,313	7	313	85
Total Ret.ExistScrub & SCR	146,767	116,922	263,688	1,468	1,169	2,637	313	32	345	682	2	248	68
Total Ret.SNCR	11,902	7,621	19,523	116	74	190	27	11	39	138	0	18	5
Total Ret.ExistScrub & SNCR	4,943	3,301	8,244	52	34	86	13	5	19	17	0	8	2
Total Ret.SCR+Scrb	3,970	3,153	7,122	41	32	73	20	2	21	9	0	7	2
Total Ret.SNCR+Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.Gas Reburn	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub+GasR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.GasReburn+Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & Srub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistNOx&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SNCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.O/G SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.O/G SNCR	0	1,291	1,291	0	13	13	0	1	1	0	0	1	0
Total Ret.Nuclear (age 30+10 yrs)	41,912	30,971	72,883	443	327	770	0	0	0	0	0	0	0
Total Ret.Nuclear (age 40+20 yrs)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret. Biomass Cofiring	0	0	0	0	0	0	0	0	0	0	0	0	0
System Total Across Fuel Types	2,210,278	1,739,264	3,949,547	19,482	15,376	34,858	2,796	1,481	4,277	10,169	45	2,316	632
System Total Without Imports	2,181,811	1,718,719	3,900,534	19,482	15,376	34,858	2,796	1,481	4,277	10,169	45	2,316	632

¹ Summer months include May-September

² Winter months include October-April

Table 9.13. EPA Base Case 2000 Regional Emissions Summary in 2010

NERC Region	Generation (GWh)			Fuel Use (TBtu)			NO _x Emissions (MTons)			SO ₂ Emissions (MTons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
ECAR	375,083	274,743	649,826	3,617	2,645	6,262	760	163	924	2,833	10	537	146
ERCT	174,687	160,776	335,463	1,505	1,426	2,932	104	107	211	486	2	180	49
MAAC	158,871	120,312	279,183	1,466	1,109	2,575	191	59	250	852	5	142	39
MAIN	156,415	122,476	278,891	1,549	1,202	2,751	263	132	395	873	4	203	55
MAPP	104,903	82,447	187,350	1,026	807	1,833	216	168	384	548	4	151	41
NPCC	166,544	125,964	292,509	1,092	849	1,941	67	44	111	357	2	103	28
FRCC	98,655	90,660	189,315	864	796	1,661	83	79	162	202	1	101	27
SERC	530,376	414,501	944,876	4,809	3,803	8,613	634	337	971	2,568	8	518	141
SPP	119,223	104,099	223,323	1,083	964	2,046	179	150	328	515	4	168	46
WSCC	431,888	333,537	765,426	3,208	2,444	5,652	308	243	550	480	6	326	89
System Total	2,316,644	1,829,514	4,146,158	20,220	16,045	36,265	2,804	1,481	4,285	9,712	45	2,429	662

¹ Summer months include May-September

² Winter months include October-April

Table 9.14. EPA Base Case 2000 Technology Emissions Summary in 2010

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ₂	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Scrubbed Coal_NOx	20,510	16,207	36,717	196	154	350	16	7	23	36	0	33	9
Total Scrubbed Coal	207,516	162,138	369,654	2,154	1,681	3,835	437	341	779	575	6	364	99
Total Unscrubbed Coal_NOx	38,094	26,602	64,696	366	255	621	88	24	112	503	2	58	16
Total Unscrubbed Coal	517,170	366,108	883,278	5,220	3,687	8,907	1,055	739	1,794	5,008	20	845	230
Total Oil/Gas Steam	26,793	61,567	88,360	265	613	878	31	76	108	13	0	47	13
Total Oil/Gas Steam_NoX	15,718	3,984	19,702	149	38	187	1	0	2	1	0	10	3
Total Nuclear	264,884	198,720	463,605	2,787	2,094	4,881	0	0	0	0	0	0	0
Total Hydro	154,335	114,860	269,195	0	0	0	0	0	0	0	0	0	0
Total Comb.Cycle Gas	345,059	279,769	624,828	2,318	1,904	4,222	78	68	146	0	0	224	61
Total IGCC	2,652	2,050	4,702	19	15	34	1	1	2	0	0	3	1
Total Turbine	33,449	49,953	83,402	302	482	783	16	25	41	0	0	42	11
Total Biomass	4,572	2,915	7,486	42	27	69	0	0	1	3	0	0	0
Total Geothermal	11,600	9,168	20,767	299	237	536	0	0	0	0	2	0	0
Total Landfill Gas	407	310	717	4	3	8	1	0	1	0	0	0	0
Total Wind	2,768	1,552	4,319	0	0	0	0	0	0	0	0	0	0
Total Fuel Cell	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Solar	517	274	791	0	0	0	0	0	0	0	0	0	0
Total Non Fossil_Other	9,309	7,342	16,651	102	81	183	0	0	0	0	1	0	0
Total Fossil_Other	201	153	355	2	2	4	1	1	1	0	0	0	0
Total Pump Storage	6,235	4,964	11,199	0	0	0	0	0	0	0	0	0	0
Total Int. Imports	18,861	13,612	32,473	0	0	0	0	0	0	0	0	0	0
Total Cgn_Coal	15,984	12,134	28,118	145	110	255	28	21	49	128	1	24	7
Total Cgn_Gas	35,290	36,249	71,538	302	311	613	15	17	32	0	0	33	9
Total Cgn_Oil	1,786	1,448	3,234	14	11	25	0	0	0	0	0	1	0
Total Cgn_Other	3,969	2,925	6,893	27	20	47	1	1	2	1	0	0	0
Total NonCG IPP_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Oil	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SteamOnly Cogen	0	0	0	0	0	0	0	0	0	0	0	0	0

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Rep.Coal-CC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Rep.O/G-CC	61,656	48,203	109,858	407	318	726	4	3	7	0	0	39	11
Total Rep.Coal-IGCC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.Scrubber	22,460	17,838	40,298	227	180	407	57	45	102	38	1	38	10
Total Ret.ExistSCR & Scrub	7,886	6,264	14,150	80	64	144	18	1	20	14	0	13	4
Total Ret.ExistSNCR & Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR	218,537	174,026	392,563	2,064	1,644	3,708	551	47	598	2,441	8	349	95
Total Ret.ExistScrub & SCR	151,037	120,313	271,350	1,512	1,205	2,717	319	33	352	697	2	255	70
Total Ret.SNCR	20,672	13,425	34,096	201	131	332	45	19	64	221	1	31	8
Total Ret.ExistScrub & SNCR	7,122	5,031	12,153	73	51	124	18	8	26	24	0	12	3
Total Ret.SCR+Scrb	4,936	3,921	8,857	50	40	90	21	2	23	10	0	8	2
Total Ret.SNCR+Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.Gas Reburn	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub+GasR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.GasReburn+Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & Srub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistNOx&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SNCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.O/G SCR	0	533	533	0	5	5	0	0	0	0	0	0	0
Total Ret.O/G SNCR	0	2,226	2,226	0	22	22	0	1	1	0	0	1	0
Total Ret.Nuclear (age 30+10 yrs)	75,639	56,205	131,844	798	593	1,391	0	0	0	0	0	0	0
Total Ret.Nuclear (age 40+20 yrs)	9,022	6,528	15,550	94	68	162	0	0	0	0	0	0	0
Total Ret. Biomass Cofiring	0	0	0	0	0	0	0	0	0	0	0	0	0
System Total Across Fuel Types	2,316,644	1,829,514	4,146,158	20,220	16,045	36,265	2,804	1,481	4,285	9,712	45	2,429	662
System Total Without Imports	2,297,782	1,815,902	4,113,685	20,220	16,045	36,265	2,804	1,481	4,285	9,712	45	2,429	662

¹ Summer months include May-September

² Winter months include October-April

Table 9.15. EPA Base Case 2000 Regional Emissions Summary in 2015

NERC Region	Generation (GWh)			Fuel Use (TBtu)			NO _x Emissions (MTons)			SO ₂ Emissions (MTons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
ECAR	383,212	282,931	666,142	3,674	2,705	6,379	778	173	952	2,639	10	557	152
ERCT	194,021	179,704	373,724	1,625	1,549	3,174	104	110	213	302	2	194	53
MAAC	166,785	125,793	292,577	1,527	1,149	2,676	197	61	258	709	4	148	40
MAIN	163,139	128,072	291,211	1,603	1,248	2,851	270	134	404	886	4	212	58
MAPP	109,185	85,284	194,468	1,063	834	1,897	220	172	392	498	4	156	42
NPCC	173,971	129,692	303,663	1,129	863	1,992	68	43	111	281	1	109	30
FRCC	106,397	98,551	204,948	909	844	1,752	83	75	159	203	1	105	29
SERC	567,189	446,458	1,013,645	5,068	4,041	9,109	643	328	971	2,600	9	547	149
SPP	124,339	109,033	233,373	1,113	996	2,109	179	150	329	503	4	172	47
WSCC	461,324	356,800	818,126	3,318	2,537	5,855	303	240	544	480	6	337	92
System Total	2,449,559	1,942,319	4,391,880	21,029	16,766	37,795	2,845	1,488	4,332	9,100	43	2,536	692

¹ Summer months include May-September

² Winter months include October-April

Table 9.16. EPA Base Case 2000 Technology Emissions Summary in 2015

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ₂	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Scrubbed Coal_NOx	20,510	16,207	36,717	196	154	350	16	7	23	35	0	33	9
Total Scrubbed Coal	208,350	163,111	371,461	2,164	1,692	3,856	440	343	783	569	6	366	100
Total Unscrubbed Coal_NOx	38,186	26,447	64,633	367	254	620	88	22	111	470	2	58	16
Total Unscrubbed Coal	479,492	344,226	823,719	4,854	3,473	8,327	982	699	1,681	4,342	18	789	215
Total Oil/Gas Steam	11,625	52,116	63,741	117	517	634	20	64	84	13	0	34	9
Total Oil/Gas Steam_NoX	13,826	1,284	15,109	131	12	143	1	0	1	1	0	8	2
Total Nuclear	135,662	101,534	237,196	1,423	1,065	2,489	0	0	0	0	0	0	0
Total Hydro	154,335	114,860	269,195	0	0	0	0	0	0	0	0	0	0
Total Comb.Cycle Gas	455,328	361,286	816,614	2,995	2,408	5,403	81	70	151	0	0	287	78
Total IGCC	2,652	2,050	4,702	19	15	34	1	1	2	0	0	3	1
Total Turbine	71,116	87,926	159,041	598	789	1,387	30	41	71	0	0	74	20
Total Biomass	4,613	2,678	7,291	43	25	67	0	0	1	3	0	0	0
Total Geothermal	11,600	9,168	20,767	299	237	536	0	0	0	0	2	0	0
Total Landfill Gas	407	310	717	4	3	8	1	0	1	0	0	0	0
Total Wind	2,768	1,552	4,319	0	0	0	0	0	0	0	0	0	0
Total Fuel Cell	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Solar	517	274	791	0	0	0	0	0	0	0	0	0	0
Total Non Fossil_Other	9,309	7,342	16,651	102	81	183	0	0	0	0	1	0	0
Total Fossil_Other	201	153	355	2	2	4	1	1	1	0	0	0	0
Total Pump Storage	6,101	5,064	11,165	0	0	0	0	0	0	0	0	0	0
Total Int. Imports	19,411	14,009	33,419	0	0	0	0	0	0	0	0	0	0
Total Cgn_Coal	16,099	12,327	28,426	146	112	258	29	22	50	129	1	24	7
Total Cgn_Gas	29,609	30,036	59,645	248	251	499	13	14	27	0	0	26	7
Total Cgn_Oil	1,786	1,168	2,954	14	9	22	0	0	0	0	0	1	0
Total Cgn_Other	4,041	3,146	7,187	28	21	49	1	1	2	1	0	0	0
Total NonCG IPP_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Oil	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SteamOnly Cogen	0	0	0	0	0	0	0	0	0	0	0	0	0

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Rep.Coal-CC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Rep.O/G-CC	66,230	51,678	117,908	438	341	779	4	3	8	0	0	41	11
Total Rep.Coal-IGCC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.Scrubber	33,724	27,080	60,804	349	281	630	78	63	141	66	1	60	16
Total Ret.ExistSCR & Scrub	7,886	6,264	14,150	80	64	144	18	1	20	17	0	13	4
Total Ret.ExistSNCR & Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR	216,314	171,762	388,077	2,049	1,627	3,676	550	47	597	2,274	7	346	94
Total Ret.ExistScrub & SCR	149,986	119,986	269,972	1,502	1,201	2,703	319	33	352	668	2	254	69
Total Ret.SNCR	44,689	30,699	75,388	433	296	729	91	40	130	452	1	69	19
Total Ret.ExistScrub & SNCR	7,122	5,269	12,391	73	54	126	18	8	26	22	0	12	3
Total Ret.SCR+Scrb	21,493	17,071	38,564	209	166	374	61	5	66	36	0	35	10
Total Ret.SNCR+Scrub	987	784	1,771	10	8	18	2	1	3	2	0	2	0
Total Ret.Gas Reburn	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub+GasR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.GasReburn+Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & Srub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistNOx&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SNCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.O/G SCR	0	508	508	0	5	5	0	0	0	0	0	0	0
Total Ret.O/G SNCR	890	2,540	3,430	9	25	34	0	1	2	0	0	2	0
Total Ret.Nuclear (age 30+10 yrs)	117,890	87,678	205,568	1,235	920	2,155	0	0	0	0	0	0	0
Total Ret.Nuclear (age 40+20 yrs)	84,806	62,728	147,534	893	660	1,553	0	0	0	0	0	0	0
Total Ret. Biomass Cofiring	0	0	0	0	0	0	0	0	0	0	0	0	0
System Total Across Fuel Types	2,449,559	1,942,319	4,391,880	21,029	16,766	37,795	2,845	1,488	4,332	9,100	43	2,536	692
System Total Without Imports	2,430,148	1,928,310	4,358,461	21,029	16,766	37,795	2,845	1,488	4,332	9,100	43	2,536	692

¹ Summer months include May-September

² Winter months include October-April

Table 9.17. EPA Base Case 2000 Regional Emissions Summary in 2020

NERC Region	Generation (GWh)			Fuel Use (TBtu)			NO _x Emissions (MTons)			SO ₂ Emissions (MTons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
ECAR	391,595	289,790	681,384	3,725	2,757	6,482	793	174	967	2,655	9	576	157
ERCT	210,948	196,321	407,269	1,729	1,657	3,387	102	110	212	310	2	206	56
MAAC	174,357	132,771	307,128	1,583	1,196	2,779	200	61	261	632	4	154	42
MAIN	166,689	131,885	298,575	1,629	1,284	2,913	272	137	409	891	4	216	59
MAPP	111,096	87,036	198,132	1,080	849	1,929	221	174	395	500	4	158	43
NPCC	174,692	130,105	304,796	1,144	874	2,018	70	47	116	292	1	115	31
FRCC	113,495	105,697	219,192	953	890	1,842	83	74	157	207	1	110	30
SERC	598,845	473,256	1,072,102	5,278	4,236	9,514	648	324	972	2,629	9	571	156
SPP	131,185	115,074	246,259	1,162	1,041	2,203	181	151	332	506	4	177	48
WSCC	487,077	377,405	864,480	3,451	2,653	6,104	305	242	547	480	6	350	96
System Total	2,559,980	2,039,338	4,599,318	21,734	17,437	39,171	2,874	1,494	4,368	9,101	43	2,634	718

¹ Summer months include May-September

² Winter months include October-April

Table 9.18. EPA Base Case 2000 Technology Emissions Summary in 2020

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ₂	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Scrubbed Coal_NOx	20,510	16,290	36,800	196	155	351	16	7	23	33	0	33	9
Total Scrubbed Coal	208,008	164,208	372,216	2,161	1,704	3,865	439	346	785	565	6	367	100
Total Unscrubbed Coal_NOx	35,670	25,169	60,839	344	242	586	83	24	108	388	2	55	15
Total Unscrubbed Coal	445,182	327,149	772,330	4,522	3,312	7,834	921	670	1,591	4,092	17	743	203
Total Oil/Gas Steam	7,994	44,174	52,168	80	438	518	14	54	68	13	0	28	8
Total Oil/Gas Steam_NoX	5,249	205	5,454	50	2	52	1	0	1	1	0	3	1
Total Nuclear	46,447	33,861	80,308	491	358	850	0	0	0	0	0	0	0
Total Hydro	154,335	114,860	269,195	0	0	0	0	0	0	0	0	0	0
Total Comb.Cycle Gas	559,626	434,713	994,339	3,656	2,869	6,525	87	74	161	0	0	346	94
Total IGCC	2,652	2,050	4,702	19	15	34	1	1	2	0	0	3	1
Total Turbine	98,311	116,680	214,991	813	1,028	1,841	41	53	94	0	0	98	27
Total Biomass	4,613	2,539	7,152	43	23	66	0	0	1	3	0	0	0
Total Geothermal	11,600	9,168	20,767	299	237	536	0	0	0	0	2	0	0
Total Landfill Gas	407	310	717	4	3	8	1	0	1	0	0	0	0
Total Wind	2,768	1,552	4,319	0	0	0	0	0	0	0	0	0	0
Total Fuel Cell	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Solar	517	274	791	0	0	0	0	0	0	0	0	0	0
Total Non Fossil_Other	9,309	7,342	16,651	102	81	183	0	0	0	0	1	0	0
Total Fossil_Other	201	153	355	2	2	4	1	1	1	0	0	0	0
Total Pump Storage	5,423	5,665	11,088	0	0	0	0	0	0	0	0	0	0
Total Int. Imports	15,834	11,427	27,261	0	0	0	0	0	0	0	0	0	0
Total Cgn_Coal	16,086	12,473	28,559	146	113	259	29	22	50	130	1	24	7
Total Cgn_Gas	30,686	26,856	57,542	255	221	476	14	14	28	0	0	25	7
Total Cgn_Oil	1,786	1,152	2,937	14	9	22	0	0	0	0	0	1	0
Total Cgn_Other	3,986	3,084	7,070	27	21	48	1	1	2	1	0	0	0
Total NonCG IPP_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total NonCG IPP_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Coal	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Gas	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Oil	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Blr_Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SteamOnly Cogen	0	0	0	0	0	0	0	0	0	0	0	0	0

Plant Type/Retrofit	Generation (GWh)			Fuel Use (Tbtu)			NO _x Emissions (MTons)			SO ₂ Emissions (Mtons)	Mercury Emissions (Tons)	CO ₂ Emissions (million Tonnes)	Carbon Emissions (million Tonnes)
	Winter ¹	Summer ²	Total	Winter ₁	Summer ₂	Total	Winter ₁	Summer ₂	Total	Total	Total	Total	Total
Total Rep.Coal-CC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Rep.O/G-CC	66,957	51,992	118,949	442	343	786	4	3	8	0	0	42	11
Total Rep.Coal-IGCC	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.Scrubber	34,096	27,080	61,176	353	281	634	79	63	142	67	1	60	16
Total Ret.ExistSCR & Scrub	10,349	8,219	18,569	103	82	185	23	2	25	20	0	17	5
Total Ret.ExistSNCR & Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR	239,978	191,816	431,794	2,277	1,822	4,099	590	52	641	2,435	8	386	105
Total Ret.ExistScrub & SCR	150,434	119,896	270,330	1,506	1,201	2,707	319	33	352	660	2	254	69
Total Ret.SNCR	63,056	44,268	107,324	617	431	1,048	128	58	186	631	2	99	27
Total Ret.ExistScrub & SNCR	7,719	5,743	13,463	79	59	137	19	9	28	22	0	13	3
Total Ret.SCR+Scrb	21,493	17,071	38,564	209	166	374	61	5	66	39	0	35	10
Total Ret.SNCR+Scrub	987	784	1,771	10	8	18	2	1	3	2	0	2	0
Total Ret.Gas Reburn	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub+GasR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.GasReburn+Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistScrub&ACI&SNCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ACI & Srub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ACI&Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSNCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistSCR&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.ExistNOx&ExistScrub&ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.SNCR & Scrub & ACI	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ret.O/G SCR	0	400	400	0	4	4	0	0	0	0	0	0	0
Total Ret.O/G SNCR	0	3,102	3,102	0	31	31	0	2	2	0	0	2	0
Total Ret.Nuclear (age 30+10 yrs)	151,040	113,747	264,786	1,578	1,189	2,767	0	0	0	0	0	0	0
Total Ret.Nuclear (age 40+20 yrs)	126,669	93,868	220,537	1,334	989	2,323	0	0	0	0	0	0	0
Total Ret. Biomass Cofiring	0	0	0	0	0	0	0	0	0	0	0	0	0
System Total Across Fuel Types	2,559,980	2,039,338	4,599,318	21,734	17,437	39,171	2,874	1,494	4,368	9,101	43	2,634	718
System Total Without Imports	2,544,146	2,027,911	4,572,057	21,734	17,437	39,171	2,874	1,494	4,368	9,101	43	2,634	718

¹ Summer months include May-September

² Winter months include October-April